

Message Text

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FOLLOWING REPEAT IAEA VIENNA 1873 ACTION SECSTATE INFO AEC GERMANTOWN
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QUOTE

UNCLAS IAEA VIENNA 1873

E.O. 11652: N/A

TAGS: IAEA TECH

SUBJECT: ERICSSON/IAEA PNE PAPER

REF: STATE 41761

AEC ALSO PASS NORDYKE, LIVERMORE

1. MISSION HAS RECEIVED INFORMALLY FROM IAEA SECRETARIAT
LATEST DRAFT SUBJECT PAPER WHICH TAKES INTO ACCOUNT THOSE
COMMENTS OF NORDYKE AND OF USSR WHICH ERICSSON WILLING
ACCEPT. SIGNIFICANT CHANGES FROM ORIGINAL DRAFT DATED
FEBRUARY 7, FEBRUARY 7 (WHICH IS ONE NORDYKE COMMENTED
ON), OMITTING MINOR EDITORIAL OR STYLISTIC CHANGES, FOLLOW.

2. OPENING PARA NOW READS "THE TECHNOLOGICAL ATTRACTION
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OF NUCLEAR EXPLOSIONS FOR PEACEFUL PURPOSES (PNE) IS THAT

THEY REPRESENT A VERY CHEAP SOURCE OF CONCENTRATED ENERGY FOR US IN THE DEVELOPMENT OF NATURAL RESOURCES AND IN GEOGRAPHICAL ENGINEERING. THE YIELDS OF INTEREST FOR CONTAINED PNE APPLICATIONS MAY VARY FROM A FEW KILOTONS TO 100 KT OR SO, WHILE FOR CRATERING APPLICATIONS THEY MAY RANGE UP TO SEVERAL HUNDREDS OF KILOTONS OR EVEN A FEW MEGATONS. PNE PROJECTS, PARTICULARLY THOSE INVOLVING HIGH YIELDS, MAY AFFECT LARGE EXPANSES OF LAND OCCUPIED BY MANY PEOPLE. CONSEQUENTLY, ONE MUST MAKE SURE NOT ONLY THAT THEY ARE TECHNICALLY FEASIBLE AND ECONOMICALLY USEFUL BUT ALSO THAT THE TECHNOLOGY IS RELIABLE AND SAFE. IN VIEW OF THE FACT THAT THE EXPERIENCE OF EMPLOYING PNE TECHNOLOGY IS STILL LIMITED, SPECIAL ATTENTION MUST BE PAID TO THE INTRINSICALLY NORMAL RELIABILITY AND SAFETY REQUIREMENTS."

3. IN SECOND PARA, FIRST, SECOND AND THIRD SENTENCES REPLACED BY FOLLOWING: "ALL LARGE-SCALE ENGINEERING PROJECTS PRODUCE A NUMBER OF ENVIRONMENTAL EFFECTS WHICH HAVE TO BE CONSIDERED CAREFULLY. PNE PROJECTS HAVE TWO UNIQUE IMPACTS--RADIOACTIVITY AND GROUND MOTION--WHICH REQUIRE PARTICULAR ATTENTION SINCE THEY POSE SPECIAL HEALTH AND SAFETY PROBLEMS AND ALSO PROBLEMS OF COMMUNITY ACCEPTANCE."

4. THIRD PARA REPLACED BY FOLLOWING: "LARGE-SCALE PNE PROJECTS COULD EASILY RAISE LEGAL QUESTIONS SUCH AS THOSE OF INTERNATIONAL LIABILITY AND ARMS CONTROL, ESPECIALLY IF CRATERING EXPLOSIONS AND YIELDS OF OVER 100 KT WERE INVOLVED. HOWEVER, THE LEGAL QUESTIONS ASSOCIATED WITH PNE WILL NOT BE CONSIDERED HERE; A DISCUSSION OF THE CONDITIONS FOR THE NON-CONTROVERSIAL USE OF PNE CAN BE FOUND IN REF. 1."

5. IN FIFTY PARA, SECOND SENTENCE REPLACED BY FOLLOWING: "AT THAT TIME, IT WAS CONCLUDED THAT: THERE WAS A VERY GOOD BASIC UNDERSTANDING AS REGARDS CONTAINED EXPLOSIONS; MORE EXPERIENCE OF THE INDUSTRIAL APPLICATIONS ENVISAGED WAS NECESSARY; SEISMIC DAMAGE APPEARED TO BE THE MAIN SAFETY CONSIDERATION LIMITING THE USE OF CONTAINED EXPLOSIONS; MORE DATA WERE NEEDED ON THE USE OF NUCLEAR EXPLOSIONS IN CANAL EXCAVATION PROJECTS."

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6. ALSO IN FIFTH PARA, LAST SENTENCE NOW READS: "IT WAS NOTED IN THE PAPER THAT THE QUENCHING OF GAS WELL FIRES BY MEANS OF NUCLEAR EXPLOSIONS HAD BEEN DEMONSTRATED IN PRACTICE, AN OPTIMISTIC VIEW WAS TAKEN CONCERNING THE FEASIBILITY OF THE HIGH-PRESSURE UNDERGROUND STORAGE OF GAS AND IT WAS CONCLUDED THAT PNE COULD REASONABLY BE CONTEMPLATED FOR THE CONSTRUCTION OF HARBOURS AND SIMPLE RESERVOIRS."

7. SIXTH PARA HAS BEEN SLIGHTLY REDRAFTED SO THAT E.G. "SCATTER" REFERS TO EXPERIMENTAL RESULTS, "FAR-GOING" REPLACED BY "RIGOROUS", ETC. LAST THREE SENTENCES REPLACED BY FOLLOWING: "FOR SOME APPLICATIONS SUFFICIENT EXPERIMENTAL DATA HAVE BEEN COLLECTED TO PERMIT VERY ACCURATE FORECASTING, WHEREAS FOR OTHER SUFFICIENT DATA ARE CLEARLY NOT AVAILABLE."

8. IN SEVENTH PARA, SECOND SENTENCE, "AND TUFF" ADDED AFTER "ALLUVIUM" AND "BASALT" ADDED AFTER "GRANITE". FOURTH AND FIFTH SENTENCES REPLACED BY FOLLOWING. "DATA UN EXPLOSIONS IN CARBONATE ROCK AND WET CLAY WERE REPORTED DURING LATER PANEL MEETINGS, BUT THEY WERE SPARSE AND ARE STILL NOT SUFFICIENT FOR FAR-REACHING CONCLUSIONS TO BE DRAWN ABOUT EXPLOSIONS IN THOSE ROCK TYPES. IT WOULD BE UNWISE AT PRESENT TO DRAW CONCLUSIONS ABOUT EXPLOSIONS IN UNTESTED, COMPLETELY DIFFERENT ROCK TYPES, ALTHOUGH THE ONE- AND TWO-DIMENSIONAL CODES DEVELOPPED IN ONE COUNTRY FOR MAKING PREDICTIONS OF THE KIND INDICATED ABOVE CAN ALSO BE USED FOR PREDICTING--ON THE BASIS OF MEASURED GEOPHYSICAL PARAMETERS--THE RESULTS OF EXPLOSIONS IN ROCK TYPES WHICH HAVE NOT YET BEEN THOROUGHLY STUDIED."

9. FIRST SENTENCE OF EIGHTH PARA REPLACED BY FOLLOWING: "ALREADY AT THE TIME OF THE 1970 PANEL MEETINGS, THE DIFFICULTY OF UNDERSTANDING THE PROCESS OF FRACTURING NEAR THE CAVITY AND CHIMNEY WAS APPRECIATED; STUDY OF THIS QUESTION HAS CONTINUED AND GREATER UNDERSTANDING OF THE FRACTURING PROCESS, GAINED THROUGH BOTH EXPERIMENTAL AND THEORETICAL INVESTIGATIONS, HAS EMERGED FROM PAPERS PRESENTED AT LATER PANEL MEETINGS."

10. IN NINTH PARA, LAST PHRASE SECOND SENTENCE AND LAST UNCLASSIFIED

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SENTENCE NOW READ: "...PARTICULARLY IF THE EXPLOSIVE IS TO BE DETONATED AT A CONSIDERABLE DEPTH. WITH THESE CONSIDERATIONS IN MIND, SPECIAL NUCLEAR EXPLOSIVES FOR CRATERING EXPLOSIONS AND FOR CONTAINED EXPLOSIONS CONNECTED WITH THE EXPLOITATION OF HYDROCARBON DEPOSITS HAVE BEEN DEVELOPED IN SOME COUNTRIES."

11. IN ELEVENTH PARA, SECOND SENTENCE NOW READS "PNE ACTIVITIES CAN BE DIVIDED INTO THREE GROUPS: "...AND IN ITEM (2) WHICH FOLLOWS, "NATURAL CONDITIONS" REPLACED BY "ACTUAL FIELD CONDITIONS".

12. IN TWELFTH PARA, FIRST SENTENCE NOW ENDS WITH "PRACTICE" AND LAST SENTENCE REPLACED WITH ADDITION TO SECOND SENTENCE, AS FOLLOWS: "...ENVISAGED APPLICATION, AND DETAILS OF

GEOLOGY AND GEOGRAPHY AND ALSO OTHER FACTORS COMPLICATE DIRECT ECONOMIC COMPARISON WITH CONVENTIONAL ALTERNATIVES."

13. IN THIRTEENTH PARA, FIRST TWO SENTENCES NOW COMBINED AND REFERENCE IN ORIGINAL THIRD SENTENCE TO "NEARLY DEPLETED OIL WELLS" CHANGED TO "OIL DEPOSITS". IN FOLLOWING SENTENCE REFERENCE TO "LIQUIFIED GAS" CHANGED TO "LIQUID GAS-CONDENSATE" AND REFERENCE TO "CONVENTIONAL RESERVOIRS" IN NEXT SENTENCE CHANGED TO "CONVENTIONAL STORAGE FACILITIES". SENTENCE REFERRING TO UK AND FRANCE NOW READS "IN THE UNITED KINGDOM AND FRANCE, THE STORAGE OF GAS AND OIL BENEATH THE SEA BED IN CAVITIES MADE BY NUCLEAR EXPLOSIONS IS BEING STUDIED."

14. FOURTEENTH PARA NOW READS, IN ENTIRETY: "A NUMBER OF EXPERIMENTS MAY BE REGARDED AS FALLING INTO THE SECOND GROUP."

15. IN FIFTEENTH PARA, SECOND SENTENCE, "VERY" IS DELETED BEFORE "SIGNIFICANTLY". IN LAST SENTENCE (NOW COMBINED) WITH PREVIOUS ONE), "DATA OBTAINED ARE AT PRESENT BEING AND ANALYZED", RATHER THAN "UNDER STUDY".

16. IN SEVENTEENTH PARA, "15-KT" INSERTED BETWEEN "THREE" AND "NUCLEAR". SENTENCE STARTING WITH "THE OBTAINED DATA SUPPORT THE FEASIBILITY ..." NOW READS " THE DATA OBTAINED POINT TO THE FEASIBILITY OF USING UNDERGROUND NUCLEAR UNCLASSIFIED

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EXPLOSIONS IN IMPLEMENTING, ETC."

17. IN EIGHTEENTH PARA, LAST SENTENCE NOW READS: "THE TECHNOLOGY HAS BEEN DEVELOPED FOR SINGLE EXPLOSIONS OF UP TO 100 KT AND MULTIPLE EXPLOSIONS INVOLVING NUCLEAR DEVICES OF UP TO 15 KT EACH, BUT MULTIPLE EXPLOSIONS SHOULD BE STUDIED FURTHER."

18. NEW PARA INSERTED AFTER EIGHTEENTH PARA READS: "SEVERAL TECHNICAL QUESTIONS REGARDING THE EXCAVATION OF CANALS, SUCH AS THE INTERCONNECTION OF ADJACENT ROWS, REMAIN TO BE ANSWERED BY EXPERIMENTATION, PERHAPS DURING THE PRELIMINARY PHASE OF A FUTURE PROJECT. FOR VERY LARGE PROJECTS SUCH AS THE TRANSISTHMIAN CANAL PROJECT, THE FEASIBILITY OF NUCLEAR EXCAVATION HAS NOT BEEN PROVED; IT DEPENDS ON CONFIRMATION TO FTH PREDICTABILITY OF THE CHARACTERISTICS OF CRATERS PRODUCED BY MEGATON-SIZE EXPLOSIONS IN HARD ROCK."

19. NOTE: ALL NUMBERS OF PARAS HEREAFTER REFER TO PARAS AS THEY APPEAR IN FEBRUARY 7 DRAFT. NEW PARA MENTIONED IN PRECEDING PARA SHOULD BE REFERENCED AS PARA 18 BIS.

20. FIRST SENTENCE NINETEENTH PARA SHORTENED TO BEGIN:
"THE PRIMARY AIM OF THIS SECOND GROUP OF ACTIVITIES IS TO
ESTABLISH THE TECHNICAL FEASIBILITY OF THE APPLICATIONS
ENVISAGED--FOR EXAPMLE, RELIABLY INCREASING THE PREMEABILITY
... OF A SPECIFIC KIND." SENTENCES FOLLOWING REFERENCE TO
INVESTIGATIONS OF ECONOMIC UTILITY NOW READ: "IT IS ONLY
AFTER THE ECONOMIC UTILITY OF A TECHNICALLY FEASIBLE PNE
APPLICATION HAS BEEN PROVED THAT THE APPLICATION CAN BE
REGARDED AS ESTABLISHED AND BE PROMOTED TO THE FIRST GROUP
OF PNE ACTIVITIES. MUCH WILL DEPEND ON PRACTICAL CIRCUM-
STANCES AND ON THE POSSIBILITIES OFFERED BY ALTERNATIVE
TEHCNOLOGIES. IN FRANCE, DECISION THEORY IS BEING EMPLOYED
TO FIND THE RIGHT CIRCUMSTANCES FOR PNE APPLICATIONS. THE
USE OF PNE METHODS IN, SAY, THE EXPLOITATION OF HYDROCARBON
DEPOSITS ON A NATIONALLY SIGNIFICANT SCALE WILL REQUIRE VERY
SUBSTANTIAL CAPITAL INVESTMENT, SO THAT HIGH TECHNICAL
RELIABILITY WOULD BE SEEENTIAL IF COSTLY MISTAKES ARE TO BE
AVOIDED." IN LAST SENTENCE OF PARA, REFERENCE TO "SUCH
TECHNOLOGY" CHANGED TO PNE TECHNOLOGY".
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21. IN FIRST SENTENCE TWENTY-FIRST PARA, "OIL ARE TRAPPED
IN" CHANGED TO "OIL MAY BE RECOVERED FROM" AND IN SECOND
SENTENCE "CRUSHING" CHANGED TO "FRACTURING". SENTENCE
REFERRING TO "PILOT-SCALE RETORTING" NOW READS: "THE RESULTS
OF PILOT-SCALE RETORTING STUDIES IN RETORTS CONTAINING AS
MUCH AS 150 TONS OF FRACTURED SHALE SUPPORT THE BELIEF THAT
THIS TECHNIQUE IS FEASIBLE."

22. FIRST SENTENCE TWENTY-SECOND PARA NOW REFERS TO "EXTRACTION
OF HEAT FROM UNDERGROUND THERMAL ANOMALIES" AND REFERENCE
IN LAST SENTENCE TO "TRANSPORTATION TRENCHES AND ROAD
EMBANKMENTS" CHANGED TO "EMBANKMENTS AND CUTTINGS".

23. FIRST SENTENCE TWENTY-FIFTH PARA (UNDER HEADING "HEALTH
AND SAFETY ASPECTS") REMAINS VIRTUALLY SAME, WITH "IN THE
LIGHT OF" REPLACING "IN RELATION TO". REMAINDER OF PARA NOW
READS: "THE EVALUATION OF BENEFITS VERSUS NEGATIVE IMPACTS
MUST BE MADE ON A SOUND TECHNICAL BASIS, ALTHOUGH THE VALUES
ASSIGNED TO THEM MAY VARY FROM ONE PART OF THE WORLD TO
ANOTHER DEPENDING ON HOW GOVERNMENTS AND COMMUNITIES PERCEIVE
THEM. THE NEGATIVE IMPACTS THE THREE FORMS: IONIZING
RADIATION, GROUND MOTION AND ATMOSPHERIC PRESSURE WAVES. THE
HEALTH AND SAFETY PROBLEMS WHICH MIGHT BE CAUSED BY IONIZING
RADIATION WOULD DEPEND VERY MUCH ON WHETHER ONE WAS CARRYING OUT CRAT
-
ERING OR CONTAINED EXPLOSIONS."

24. IN TWENTY-SIXTH PARA, UNDERHEADING "RADIATION", LAST

TWO SENTENCES REPLACED BY FOLLOWING: "BY CONTRAST, A LARGE FRACTION OF ANY TRITIUM PRODUCED WILL BECOME INCORPORATED INTO WATER OR HYDROCARBONS IN THE VICINITY OF THE EXPLOSION. FOR THIS REASON, ALL-FISSION EXPLOSIVES ARE GENERALLY PREFERRED FOR CONTAINED EXPLOSIONS. FOR CRATERING EXPLOSIONS, WHERE ALL THE KINDS OF RADIOACTIVITY PRODUCED FIND THEIR WAY INTO THE ATMOSPHERE TO SOME EXTENT, THERMONUCLEAR EXPLOSIVES ARE PREFERABLE IN THAT THE FISSION CONTRIBUTION IS KEPT SMALL, MOST OF THE EXPLOSIVE ENERGY COMING FROM FUSION REACTIONS."

25. IN TWENTY-SEVENTH PARA, REFERENCE TO "WELL STUDIED" UNCLASSIFIED

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CHANGED TO "THOROUGHLY STUDIED".

26. TWENTY-EIGHT PARA NOW BEGINS "THE FIRST MECHANISM MAY BE REGARDED AS AN ACCIDENTAL OR UNPLANNED RELEASE WHICH HAS A VERY LOW PROBABILITY AND INVOLVES RELATIVELY SMALL POTENTIAL EXPOSURES CONFINED TO THE IMMEDIATE VICINITY OF THE EXPLOSION."

27. IN TWENTY-NINTH PARA, REFERENCE TO "NUMBER OF PROTOTYPE ...", ETC. CHANGED TO "... NUMBER OF PROJECTS CONCERNED WITH OIL DEPOSIT STIMULATION AND GAS-CONDENSATE STORAGE, AND INVOLVING PROTOTYPE FACILITIES IN ACTUAL INDUSTRIAL USE, HAS VERIFIED ..." ETC.

28. HEADING BEFORE NEXT PARA CHANGED TO READ: "RADIO-ACTIVITY PATHWAYS IN THE CASE OF EXPLOSIONS FOR EXCAVATION PURPOSES."

29. OPENING PHRASES OF THIRTIETH PARA READ: "THE FOLLOWING MECHANISMS BY WHICH RADIOACTIVITY FROM EXCAVATION EXPLOSIONS COULD REACH MAN AND HIS ENVIRONMENT HAVE ALSO BEEN THOROUGHLY STUDIED:". LAST ITEM LISTED NOW READS: "(V) UPTAKE BY ORGANISMS FROM AFFECTED RESERVOIR, RIVER, CANAL AND OFF-SHORE MARINE WATERS."

30. LAST THREE SENTENCES THIRTY-FIRST PARA REPLACED BY FOLLOWING: "RADIATION FROM THE AIR AT THE TIME OF PASSAGE OF THE EXPLOSION CLOUD AND THE BASE SURGE MAY REPRESENT A SHORT-TERM DANGER. TO KEEP EXPLOSION CLOUD AND BASE SURGE EXPOSURES WELL BELOW THE ICRP STANDARDS, EVACUATION WOULD PROBABLY BE NECESSARY."

31. THIRTY-FOURTH PARA NOW READS: "THE RADIOACTIVE PRODUCTS DEPOSITED AT LONG RANGE CONSIST OF A FEW FISSION RADIONUCLIDES (SMALL AMOUNTS OF RADIOACTIVE IODINE AND OF RADIONUCLIDES WITH GASEOUS PRECURSORS) AND TRITIUM. THE FRACTIONS OF

VARIOUS RADIONUCLIDES TRANSPORTED IN THE EXPLOSION CLOUD OVER LONG DISTANCES DEPEND ON THEIR VOLATILITY AND HALF-LIVES OR ON THOSE OF THEIR GASEOUS PRECURSORS; THE FRACTION CAN BE ABOUT 10 PERCENT FOR IODINE AND AS MUCH AS 40 PERCENT FOR STRONTIUM-90, CAESIUM-137 AND TRITIUM."

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32. HEADING PRECEDING THIRTY-FIFTH PARA NOW READS: "PREDICTION OF POPULATION EXPOSURES FOLLOWING EXCAVATION EXPLOSIONS".

33. IN FIRST SENTENCE THIRTY-FIFTH PARA, PHRASE FOLLOWING "DEVELOPMENT" CHANGED TO "OF TECHNIQUES FOR MAKING ACCURATE PREDICTIONS ABOUT THE LONG-RANGE TRANSPORT AND DEPOSITION OF RADIOACTIVITY." IN LAST SENTENCE, CHANGE REFERENCE TO "DOSE RATES" TO "DOSES".

34. IN THIRTY-SIXTH PARA, CHANGE "DOSE RATES THAT MEET THE REQUIREMENTS OF" TO "DOSES BELOW THE PERMISSIBLE ..." ETC.

35. REPLACE THIRTY-SEVENTH PARA WITH: "DURING THE MEETINGS OF THE FOURTH TECHNICAL BODY CONVENED BY THE AGENCY, IN 1975, SOVIET EXPERTS PRESENTED PROPOSALS TO LIMIT THE LONG-RANGE DOSES FROM EXCAVATION EXPLOSIONS TO A SMALL FRACTION OF THE LEVELS ENVISAGED BY ICRP AND TO LIMIT THE LONG-RANGE DEPOSITION OF CAESIUM AND STRONTIUM AS A BASIS FOR THE DEVELOPMENT OF QUANTITATIVE RADIATION SAFETY CRITERIA FOR THE LARGE-SCALE USE OF NUCLEAR EXPLOSIONS FOR EXCAVATION."

36. IN THIRTY-EIGHTH PARA, IN FIRST LISTED ITEM, INSERT COMMA AFTER "EXPLOSION" AND PHRASE "THE DEPTH AT WHICH THE EXPLOSION IS CARRIED OUT".

37. IN FIRST LINE OF THIRTY-NINTH PARA, CHANGE "A SIGNIFICANT BODY OF EXPERIENCE" TO "CONSIDERABLE EXPERIENCE".

38. FORTIETH PARA SHOULD BEGIN WITH SENTENCE WHICH READS: "THE COST OF STRENGTHENING," ETC. NEXT SENTENCE CHANGED TO READ: "EXCEPT IN VERY REMOTE AREAS, IT WILL IMPOSE A LIMIT OF YIELDS." IN LAST SENTENCE, CHANGE "THE PUBLIC" TO "COMMUNITIES".

39. OPENING SENTENCE FORTY-FIRST PARA NOW READS: "THE TOTAL YIELDS INVOLVED IN EXCAVATION EXPLOSIONS TEND TO BE LARGE THAN 150 KT, RANGING UP TO SEVERAL MEGATONS FOR SOME PROJECTS." SECOND SENTENCE REMAINS. THIRD SENTENCE READS: "THE CLOSE-IN
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AREA PROBABLY REQUIRING EVACUATION BECAUSE OF GROUND MOTION WOULD COINCIDE ROUGHLY WITH AREAS WHICH MIGHT HAVE TO BE EVACUATED BECAUSE OF RADIATION."

40. FORTY-SECOND PARA, UNDER HEADING "ATMOSPHERIC PRESSURE WAVES" NOW READS, IN ENTIRETY: "CONTAINED EXPLOSIONS OF LESS THAN 100 KT MAY PRODUCE ONLY INSIGNIFICANT PRESSURE WAVES IN THE ATMOSPHERE; THOSE FROM EXCAVATION EXPLOSIONS, HOWEVER, ARE SIGNIFICANT. THE DAMAGE CAUSED BY THE DIRECT AIR WAVE FROM AN EXCAVATION EXPLOSION CAN VARY FROM MODERATE TO HEAVY NEAR THE EXPLOSION POINT, BUT IT IS LIMITED TO A RANGE OF ABOUT 10 KM. BEYOND THAT RANGE, THE EFFECTS OF REFRACTION IN THE ATMOSPHERE PREDOMINATE."

41. FORTY-THIRD PARA, WHICH BEGINS "THE PRESSURE WAVES AT," ETC., IS DELETED.

42. FORTY-FOURTH PARA NOW READS: "IN THE TIMING OF EXPLOSIONS, KNOWLEDGE OF LOCAL WEATHER PATTERNS AND OBSERVATION OF THE WINDS IN THE ATMOSPHERE PERMIT THE SELECTION OF DAYS WHEN THE REFRACTED WAVES WILL NOT BE FOCUSED ON BUILD-UP AREAS, SO THAT DAMAGE BY AIR WAVES BEYOND THE CLOSE-IN REGION IS MINIMIZED.

43. IN FORTY-FIFTH PARA, FIRST TWO SENTENCES HAVE BEEN COMBINED. NEXT TWO SENTENCES NOW READ: "A NUMBER OF CONTAINED NUCLEAR EXPLOSIONS CARRIED OUT IN THE LIGHT OF THAT BODY OF KNOWLEDGE HAVE SHOWN THAT EXPOSURE OF THE GENERAL PUBLIC IS ONLY A SMALL FRACTION OF THE MAXIMUM PERMISSIBLE EXPOSURES ENVISAGED BY ICRP. WITH EXCAVATION PROJECTS, HOWEVER, IT MIGHT BE NECESSARY IN SOME CASES TO EVACUATE THE LOCAL POPULATION TEMPORARILY IN ORDER TO ENSURE SUCH A LOW EXPOSURE LEVEL." LAST SENTENCE RESTRUCTURED AND REFERENCE TO "ACCEPTANCE BY THE PUBLIC" CHANGED TO "COMMUNITY ACCEPTANCE" AND "DISBENEFITS" CHANGED TO "NEGATIVE IMPACTS".

4. HEADING WHICH PRECEDES FORTY-SIXTH PARA CHANGED TO "COMMUNITY ACCEPTANCE OF PNE". SIMILARLY, REFERENCE IN SLIGHTLY RESTRUCTURED FIRST SENTENCE FORTY-SIXTH PARA TO "PUBLIC ACCEPTANCE" CHANGED TO "COMMUNITY ACCEPTANCE".
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REMAINDER OF PARA REPLACED BY FOLLOWING: "THE RISKS FOR COMMUNITIES ARE CALCULATED ON THE BASIS OF ENGINEERING CALCULATIONS OF TECHNICAL RELIABILITY, PREFERABLY STATED WITH

CONFIDENCE LIMITS, AND IN THE LIGHT OF THE SAFETY MEASURES
TO BE ADOPTED. THE PROBLEM OF COMMUNITY ACCEPTANCE OF
DIFFERENT KINDS OF RISK ARISES WHEN ONE TRIES TO PRODICT
WHAT ATTITUDES WILL BE TAKEN BY THE AUTHORITIES AND BY
COMMUNITIES TOWARDS SUCH CALCULATED RISKS. THE PUBLIC IS
ESPECIALLY WARY OF RADIOACTIVITY, AND THERE IS A GROWING
TENDENCY TO QUESTION NEW APPLICATIONS OF SCIENCE. ONLY ONE
PANEL PAPER WAS ENTIRELY DEVOTED TO THIS IMPORTANT QUESTION,
WHICH STOULD BE STUDIED FURTHER." FULL STOP; END OF TEXT,
FOLLOWED BY LIST OF REFRENCES. PORTER UNQUOTE KISSINGER

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